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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/652,993	08/31/2000	Vishnu K. Agarwal	98-0616.03	4012

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EXAMINER	
DIAZ, JOSE R	
ART UNIT	**PAPER NUMBER**
2815	

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/652,993	Applicant(s) AGARWAL, VISHNU K.	
	Examiner José R Diaz	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4,76,77,81-85 and 89-92* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4,76,77,81-85 and 89-92* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *24* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

➢ A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 24, 2003 has been entered.

Claim Rejections - 35 USC § 102

➢ The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

➢ Claims 4 and 89 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al. (US 2001/0001501 A1).

- Regarding claim 4, Lee et al. teach a method of passivating a conductive material (see Fig. 1B) comprising the steps of: introducing a material, e.g. PH_3, directly over a conductive layer (21) (see paragraph [0031] on pages 3-

4); passivating a surface of said conductive layer (21) with said material (see paragraph [0031] on pages 3-4).

- Regarding claim 89, Lee et al. teach that the conductive layer comprises a polysilicon (21) (see Fig. 1B).

➢ Claims 4, 81, 85 and 89 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee (US Patent No. 5,846,859, which was cited in paper No. 19).

- Regarding claim 4, Lee teaches a method of passivating a conductive material (see Figs. 1 and 2F) comprising the steps of: introducing a material, e.g. PH_3, directly over a conductive layer (18) (see col. 4, lines 59-67); passivating a surface of said conductive layer (18) with said material (see col. 4, lines 59-67).
- Regarding claim 89, Lee teaches that the plug (18) comprises a material selected from the group consisting of polysilicon, tungsten, copper, and aluminum (see col. 4, lines 59-67).
- Regarding claims 81 and 85, Lee teaches a method for fabricating a capacitor (see Fig. 1 and 2F) comprising the steps of: providing the first conductive plug (18) (see Figs. 1 and 2F), providing a conductive layer (24) (see Fig. 2D), treating the surface of the conductive layer with a material selected from the group of phosphine and methylsilane (see col. 4, lines 59-67 and col. 5, lines 30-36), and forming the second conductive layer (26, 28, 30) (see Figs 1 and 2F).

- Regarding claim 82, Lee teaches that the plug (18) comprises a material selected from the group consisting of polysilicon, tungsten, copper, and aluminum (see col. 4, lines 59-67).

➢ Claims 10, 81 and 85 are rejected under 35 U.S.C. 102(e) as being anticipated by Hintermaier et al. (US Patent No. 6,100,187).

- Regarding claim 10, Hintermaier et al. teach a method of passivating a conductive material (see Fig. 5) comprising the steps of: introducing a material, e.g. PH_3, directly over a conductive layer (16, 28) (see col. 4, lines 33-41); passivating a surface of said conductive layer (16, 28) with said material (see col. 4, lines 33-41).
- Regarding claim 81, Hintermaier et al. teach a method of passivating a conductive material (see Fig. 5) comprising the steps of: providing the first conductive plug (16) (see Fig. 5), providing a conductive layer (28) (see Fig. 5), treating the surface of the conductive layer with a material selected from the group of phosphine and methylsilane (see col. 4, lines 33-41), and forming the second conductive layer (22, 26) (see Fig. 5).

Claim Rejections - 35 USC § 103

➢ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

➢ Claim 90 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (US Pat. No. 2001/0001501 A1) in view of Applicant's Specification.

- Regarding claim 90, the reference Lee et al. teaches a method comprising: a flow rate of about 2-400 sccm for the material; a flow rate of an inert gas; a temperature of the process; a pressure ranging from about 50 militorr to 760 torr; and a process time from about 50-500 seconds (see paragraph [0031] on page 4). However, the reference Lee et al. is silent with respect to the claimed process parameters comprising a temperature of about 150-600 °C and the flow rate of the inert gas of about 50-100 sccm, Applicant acknowledges that such claimed parameters are merely an example of the present invention, which could be altered as desired (see page 8, lines 4-16 of the Specification). Thus, in absent of any criticality, Applicant should note that it would have been obvious to one of ordinary skill in the art to modify the process temperature and/or the flow rate of the inert gas, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

➢ Claims 90 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US Patent No. 5,846,859, which was cited in paper No. 18) in view of Applicant's Specification.

- Regarding claim 90, Lee teaches the general conditions of a treatment process comprising PH_3 (see col.4, lines 59-67 and col. 5, lines 30-36). However, Lee is silent with respect to parameters of such treatment process. Applicant acknowledges that the claimed parameters are merely an example of the present invention, which could be altered as desired (see page 8, lines 4-16 of the Specification). Thus, in absent of any criticality, Applicant should note that it would have been obvious to one of ordinary skill in the art to modify the parameters of the treatment process, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.
- Regarding claim 91, Lee teaches the use of argon (see col. 5, lines 30-36).

➢ Claim 76, 81-83 and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US Pat. No.5,723,384) in view of Hintermaier et al. (US Patent No. 6,100,187).

- Regarding claims 76, 81-83 and 85, Park et al. teach a method for fabricating a capacitor (see Fig. 15) comprising the steps of: providing the first conductive plug (35) (see Fig. 11), providing a barrier WN_X layer (39) (see Fig. 15) and forming the polysilicon conductive layer on the WN_X layer (see col. 4, lines 32-33). However, Park et al. fails to teach the limitation of

treating the surface of the barrier WN_X layer with a material selected from the group of phosphine and methylsilane. Hintermaier et al. teach a method in which a barrier layer of a capacitor is treated with PH_3 (see col. 4, lines 33-41). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Park et al. to include the step of treating the surface of the conductive barrier layer with phosphine. The ordinary artisan would have been motivated to modify Park et al. in the manner described above for at least the purpose of preventing the oxidation of the contact plug.

➢ Claim 77 and 92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US Pat. No.5,723,384) in view of Hintermaier et al. (US Patent No. 6,100,187), and further in view of Applicant's Specification.

- Regarding claims 77 and 92, a further different between the present invention and the prior art is the parameters used during the passivation process. However, Applicant acknowledges that the claimed parameters are merely an example of the present invention, which could be altered as desired (see page 8, lines 4-16 of the Specification). Thus, in absent of any criticality, Applicant should note that it would have been obvious to one of ordinary skill in the art to modify the parameters of the treatment process, since it has been held that where the general conditions of a claim are

disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

➢ Claim 84 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US Pat. No.5,723,384) in view of Hintermaier et al. (US Patent No. 6,100,187), and further in view of Mark et al. (US Pat. No. 6,309,713 B1).

- Regarding claim 84, a further different between the present invention and the prior art is the material used to form the second conductive layer or upper electrode. Mark et al. ('713) teach that is well known in the art to use copper as the second conductive layer in a capacitor structure comprised of a WN_X barrier layer (see col. 4, lines 62-67 and col.5, lines 13-15). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to further modify Park et al. to include a second conductive layer formed of copper. The ordinary artisan would have been motivated to further modify Park et al. in the manner described above for at least the purpose of providing electrical contact to other semiconductor devices.

Response to Arguments

➢ Applicant's arguments with respect to claims 4, 76-77, 81-85 and 89-92 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

➢ The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are related to the present invention: Argarwal (US Pat. Nos. 6,472,264 B1 and 6,468,854 B1).

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00-5:00 Monday, Tuesday, Thursday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 746-3891 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

JRD
April 19, 2003